Name: _____                                    Date: _____
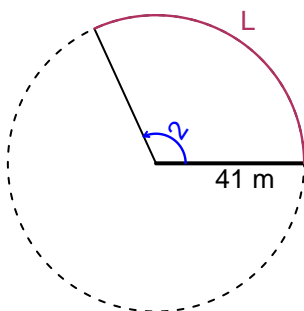
# Trig Final (SLTN v662)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

## Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 41 meters. The angle measure is 2 radians. How long is the arc in meters?
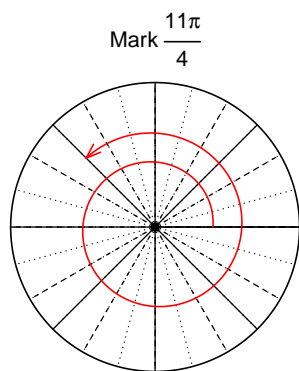


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 82$ meters.

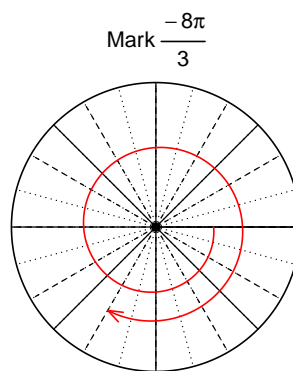## Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-8\pi}{3}\right)$ by using a unit circle (provided separately).



Mark $\dfrac{11\pi}{4}$

Find cos(11π/4)

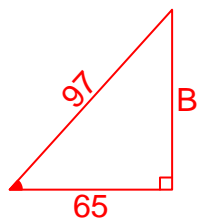Mark $\dfrac{-8\pi}{3}$

Find sin(−8π/3)

$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-8\pi/3) = \frac{-\sqrt{3}}{2}$

**Question 3**

If $\cos(\theta) = \frac{-65}{97}$, and $\theta$ is in quadrant II, determine an exact value for $\tan(\theta)$.

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.
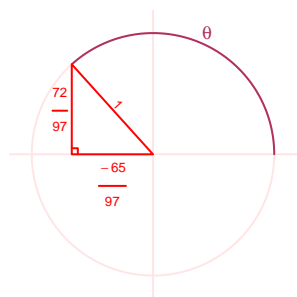


Solve the Pythagorean Equation

$$65^2 + B^2 = 97^2$$
$$B = \sqrt{97^2 - 65^2}$$
$$B = 72$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{72}{97}}{\frac{-65}{97}} = \frac{-72}{65}$$

**Question 4**

A mass-spring system oscillates vertically with a frequency of 8.26 Hz, an amplitude of 6.64 meters, and a midline at $y = -2.55$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height ($y$ in meters) as a function of time ($t$ in seconds).

Any of these equations would get full credit.

$$y = 6.64 \sin(2\pi 8.26 t) - 2.55$$

or

$$y = 6.64 \sin(16.52\pi t) - 2.55$$

or

$$y = 6.64 \sin(51.9 t) - 2.55$$